D. Johnson #4 12-8-00

Patent Application
Docket No. 27795-00018

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Leslie Gary GRAF et al.

Serial No.: 09/621,032

Filed: July 21, 2000

Art Unit: 2745

Examiner: not assigned

Entitled: SYSTEM AND METHOD OF COMMUNICATING OPERATING CAPABILITIES IN A TELECOMMUNICATION NETWORK

Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

Date of Deposit Nov 28, 2000

I hereby certify that this paper or fee is being deposited with the U.S. Postal Service as First Class Mail on the date indicated above and is addressed to the Commissioner for Patents, Box Patent Application, Washington, D.C. 20231

Type or Print Name DOROTHY MACKINNON

Dorothy Mackinnon
Signature

Dear Sir:

CLAIM OF PRIORITY UNDER 35 U.S.C. § 119

Under the provisions of 35 U.S.C. 119 Applicant hereby claims the priority of Australian patent applications Nos. PQ1783 and PQ1942 filed on July 22, 1999 and July 30, 1999 respectively, which is mentioned in the declaration of the above-identified application. A certified copy of the priority document is filed herewith.

Respectfully submitted,

JENKENS & GILCHRIST, P.C.

By: Stanley R Moore
Name: Stanley R. Moore
Reg. No.: 26,958

1445 Ross Avenue, Suite 3200
Dallas, Texas 75202
(214) 855-4713
(214) 855-4300 (fax)

Patent Office
Canberra

CERTIFIED COPY OF PRIORITY DOCUMENT

I, LEANNE MYNOTT, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 1942 for a patent by TELEFONAKTIEBOLAGET L M ERICSSON filed on 30 July 1999.

WITNESS my hand this
Twenty-sixth day of September 2000

LEANNE MYNOTT
TEAM LEADER EXAMINATION
SUPPORT AND SALES

P/00/009
Regulation 3.2

AUSTRALIA
Patents Act 1990

PROVISIONAL SPECIFICATION

FOR THE INVENTION ENTITLED:

"NEGOTIATING OPERATING CAPABILITIES BETWEEN TELECOMMUNICATION NODES "

Applicant:

TELEFONAKTIEBOLAGET L M ERICSSON

The invention is described in the following statement:

NEGOTIATING OPERATING CAPABILITIES BETWEEN TELECOMMUNICATION NODES

The present invention relates to a method of negotiating operating capabilities between telecommunication subscribers, and more particularly relates to a method of enabling codec compatibility between a first mobile station in a public land mobile network (PLMN) and a network node either located in a fixed network or in a different PLMN or in the same PLMN.

When a subscriber having a mobile station (MS) or terminal located within a first PLMN wishes to contact another subscriber having a mobile station located in a different PLMN, the firstmentioned subscriber's MS must transmit to its serving mobile switching centre (MSC) a codec or a list of codecs on which it can transmit information or messages. Codec negotiation must then be initiated over a fixed switched network, such as PSTN, or ISDN, IP or ATM with the other mobile station which it requests connection. Once a compatible codec is negotiated between the two mobile stations then the call may proceed using that codec. All of this codec negotiation requires a lot of signalling to take part between the originating mobile station and its serving MSC each time a call needs to be established.

As mobile networks are becoming more and more advanced and requiring the transmission of greater amounts of data between nodes of the network or across other networks such as a PSTN or ISDN fixed network, this creates a burdensome task for nodes within the network to process all the data. Furthermore, the signalling process takes place relatively slowly. It would therefore be desirable to remove extra data, where possible, especially between an MS and its serving MSC, in order to increase the speed of signalling and reduce the signalling load between the MS and MSC, especially for call set-up. By reducing the amount of signalling data that needs to be transmitted between an originating mobile station and its serving MSC at call set-up, the network resources could be more efficiently used.

The present invention seeks to overcome or substantially ameliorate any of the abovementioned disadvantages by providing a method of enabling and negotiating codec compatibility between a mobile station and a network terminal

whereby the amount of signalling required between the originating mobile station and its serving MSC is reduced.

Accordingly, the present invention provides a method of negotiating operating capabilities between a mobile station in a mobile telecommunications network and a network node, wherein said mobile telecommunications network includes a storage means associated with a switching centre serving said mobile station;

the method comprising the step of:

transmitting a list of one or more operating capabilities from said mobile station to the switching centre for storage in said storage means as part of a non-call based signal.

The method may further comprise the step of updating said storage means with another list of operating capabilities, such as codecs, for use by said mobile station when said mobile station moves from one location area to another location area by sending a message to said switching centre for subsequent storage in the storage means. The message may be a location update message or any existing or new message.

The network node may be located in a fixed network, such as PSTN or ISDN or in a mobile network, or it may be a mobile station located in another mobile telecommunications network.

The one or more operating capabilities may be prioritised such that a list of preferred codecs is supplied by the mobile station. Other operating capabilities may include security algorithms, as opposed to codecs, in which case the storage means will receive the list of algorithms supported by the MS for subsequent storage.

Thus, the signalling load is reduced between the MS and MSC at call set-up as the operating capabilities of the MS are already stored in the storage means associated with the switching centre and the MS does not need to transmit the operating capabilities each time it needs to establish a call. Furthermore, the MS does not need to receive the list of operating capabilities in the set-up message from the switching centre every time it receives a call.

A preferred embodiment of the invention will be hereinafter described, by way of example only, with reference to the drawings wherein: --

Figure 1 is a schematic diagram of a telecommunication system used in accordance with the present invention;

Figure 2 is a signalling diagram showing the signalling messages that are conducted between two mobile stations in the telecommunications system of Figure 1.

In Figure 1 there is shown a first mobile station 4 in a location area 6 (LA1), of a first PLMN 2, which is controlled by base station controller 8. The mobile switching centre 10 is in communication with each of the BSC 8 and a further BSC 9. The MSC 10 has an associated storage means in the form of a visitor location register (VLR) 12 in which is stored details of mobile subscribers and their mobile units that are temporarily located within its serving area, in this case LA1 and LA2. A gateway MSC (GMSC) 14 provides an interface between other networks such as a PSTN or ISDN 16. A further storage means 18 in the form of a home location register (HLR) provides permanent storage of subscriber details and keeps continuous track of the location of a subscriber whether that subscriber is in a MSC service area or in a different PLMN. This information is used by the GMSC 14 when receiving a call from another network. The PLMN 2 also has other MSCs such as MSC 20 with its own VLR 22 and whereby the MSC 20 serves BSCs 24 and 26.

When the mobile station 4 wishes to contact a further mobile station 28 located in another PLMN 30 a set-up message will be transmitted from the mobile station 4 to its serving MSC 10. Thereafter negotiation of operating capabilities, such as codecs, must take place from the MSC 10 to the PLMN 30 and in particular an MSC 29 that is serving the mobile station 28. An initial address message (IAM) is used to signal between the MSC 10 and MSC 29 of PLMN 30. The codec negotiation continues to take place and when a codec has been agreed upon between the MS 28 and MS 4 to transmit the data, then such data can be transmitted.

The MSC 10 or equivalently a Transport Independent Call Control (TICC) node has the capability to separate the ISUP signal into a Call Control (CC) portion

and a Bearer Control (BC) portion where the call control portion of ISUP carries the initial address message (IAM).

According to the present invention the mobile station 4 regularly transmits to its serving MSC 10, via a message, such as a location update message or any other existing or new message, a list of operating capabilities applicable to MS 4 which is subsequently stored in the VLR 12 associated with that MSC. The list of operating capabilities (including codecs) may be updated at predetermined times for example on polling by the serving MSC 10 or when the mobile station 4 for example changes its location area say from LA1 to LA2. Alternatively a special procedure may be set up between the MS 4 and the MSC/VLR to update the capabilities. The updated list of codecs is then subsequently stored in the VLR 12 associated with MSC 10. By doing this codec negotiation is handled between the MSC 10 and the MSC 29 as to which is a compatible codec on which both mobile stations 28 and 4 can use. The controlling MSCs of the MS4 and MS 28 know the codec options that each MS can support and the MSCs handle the codec negotiation on behalf of the MSs. Equivalently, the MS 28 has a list of codecs stored in VLR 31 which it can use. In so doing this creates less signalling at call set-up for example between the MS 4 and the MSC 10 and between the MS 28 and MSC 29. In practice when a MS 4 requires to initiate a call the MSC 10 will automatically select a codec from the list of codecs stored in the VLR 12 and then the subsequent negotiation takes place between the MSC 10 and the MSC 29. The updated list of codecs may be in order of priority so that if the most preferred codec cannot be negotiated then the next most preferred codec is attempted to be compatible.

Where a GSM network is used and a call is initiated from a MS in that network to another MS in another mobile network across a public switched network, such as PSTN or ISDN, the TICC node or MSC serving the originating MS will allocate a transcoder to adapt the codec that is eventually negotiated to PCM levels (64 kbit/s) for transit across the PSTN/ISDN for cases where the call cannot proceed in compressed format from the MSC. The MSC will obtain the list of operating capabilities from the VLR, select one, allocate a transcoder for the selected capability and inform the MS about the selection. For third generation

mobile networks, such as UMTS, the transcoding, if necessary, is done in the core network.

By separating out the CC and BC portions of ISUP, the BC portion can allow for transmission at non-PCM levels. For example, channels that only require 8 kbit/s or 16 kbit/s can be used so that when the first MS communicates with the second MS and both can use a single codec, which uses 13 kbit/s for example, then this would be preferable as only 13 kbit/s is used and not 64 kbit/s. This can be negotiated. Thus the TICC nodes using the supported list of capabilities for the affected MS through their associated VLR will negotiate the capabilities, including the codec used, between the mobile stations.

The IAM includes the list of codecs that the originating MS prefers to use and once a codec is agreed by the TICC at the receiving or destination MS, then the receiving MS will answer by confirming a selected codec to use.

If the mobile station 4 crosses over into a further location area LA3 then the VLR 22 associated with the MSC 20 which oversees BSC 24 which in turn oversees LA3 will be updated with the new temporary subscriber records of subscriber MS 4 as well as HLR 18. Consequently any codec negotiation that is to take place on initiation from a call from a mobile station 4 while it is in the location area LA3 is done through the VLR 22 and the VLR 31 of the terminating subscriber as the new VLR 22 will have the updated list of codecs and other capabilities.

An example of signalling that takes place between mobile stations during call set-up is shown in Figure 2. The mobile station 4 in PLMN 2 initiates a call set-up message at 40. This is received at the serving MSC 10 wherein an Initial Address Message (IAM) is transmitted by way of example over the core network 16 to the MSC 29 serving the terminating subscriber's mobile station 28. Signalling of the IAM is shown at 42. The IAM contains a list of codecs, which may be prioritised, on which the MS 4 can transmit. The set-up message 44 is used for signalling between the MSC 29 of the terminating subscriber and the mobile station 28. The mobile station 28 then responds, through its serving MSC 29, by negotiating or providing a list of codecs on which it can transmit to the MSC 10 at step 46. An update may be transmitted at various times or instances from MS 28 to VLR 31 at

45. Negotiation then takes place at 47 between the MSC 10 and the MSC 29. Once agreement is reached on which codec is to be used between the mobile stations 4 and 28, at 48, a ringing signal is initiated and an alert message is sent at 50 and then the MSC 29 serving the subscriber mobile station 28 sends an address complete message at 52 to the MSC 10. The MSC 29 also sends a call process message at 56 in response to receiving the alert message. On receipt of this message, an ALERT message is sent at 54 to MS 4 which responds by generating a ringing tone.

If the subscriber of mobile station 28 answers, that terminal sends a connect message at 58 which in turn is acknowledged by its serving MSC which forwards on an answer message at 60 to the MSC 10 which in turn sends a connect message 62 to the mobile station 4. Conversation can then take place between the two mobile subscribers at 64.

It is to be understood that, although this embodiment has been described in relation to a GSM network, the invention equally applies to third generation PLMN networks and other second generation PLMNs including PDC, D-AMPS, UMTS, CDMAOne and CDMA2000, having similar architectures. In the 3G networks negotiations with respect to operating capabilities, such as codecs may be done by nodes in the core networks such as a public switched network. Furthermore, the MS 28 in PLMN 30 may suitably be replaced by a network node either located in the fixed PSTN/ISDN network 16 or in the same PLMN 30. Thus such capability negotiation may take place between mobile stations in the same mobile network.

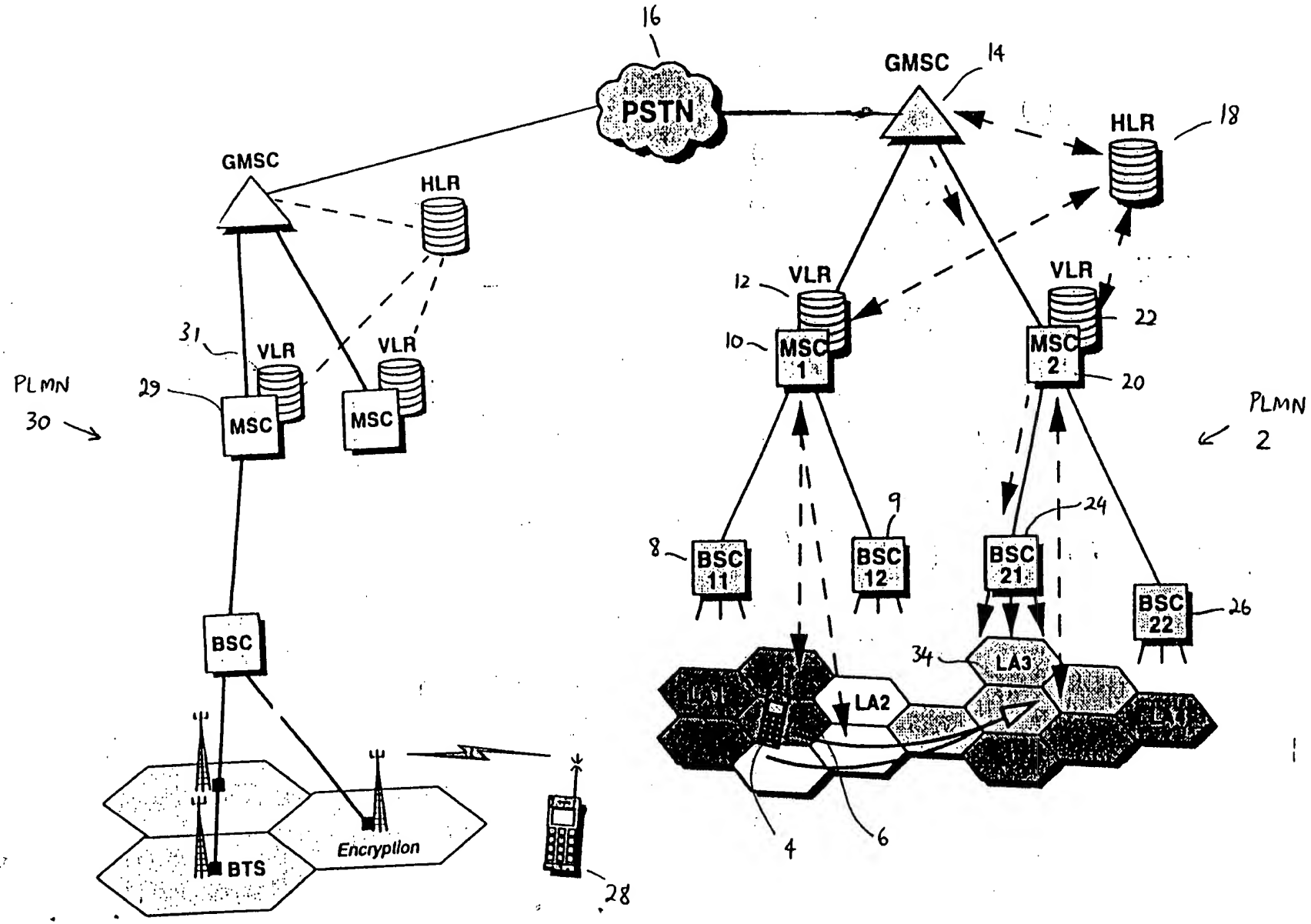
It will also be appreciated that various modifications and alterations may be made to the preferred embodiments above, without departing from the scope and spirit of the present invention.

DATED: 22 July 1999

CARTER SMITH & BEADLE
Patent Attorneys for the Applicants:

TELEFONAKTIEBOLAGET L M ERICSSON

FIGURE 1


16
PSTN
GMSC
14
HLR
18
GMSC
HLR
12
VLR
VLR
22
10
MSC 1
MSC 2
20
31
VLR
VLR
PLMN
30
29
MSC
MSC
PLMN
2
9
24
8
BSC 11
BSC 12
BSC 21
BSC 22
26
34
LA3
LA2
BSC
4
6
BTS
Encryption
28

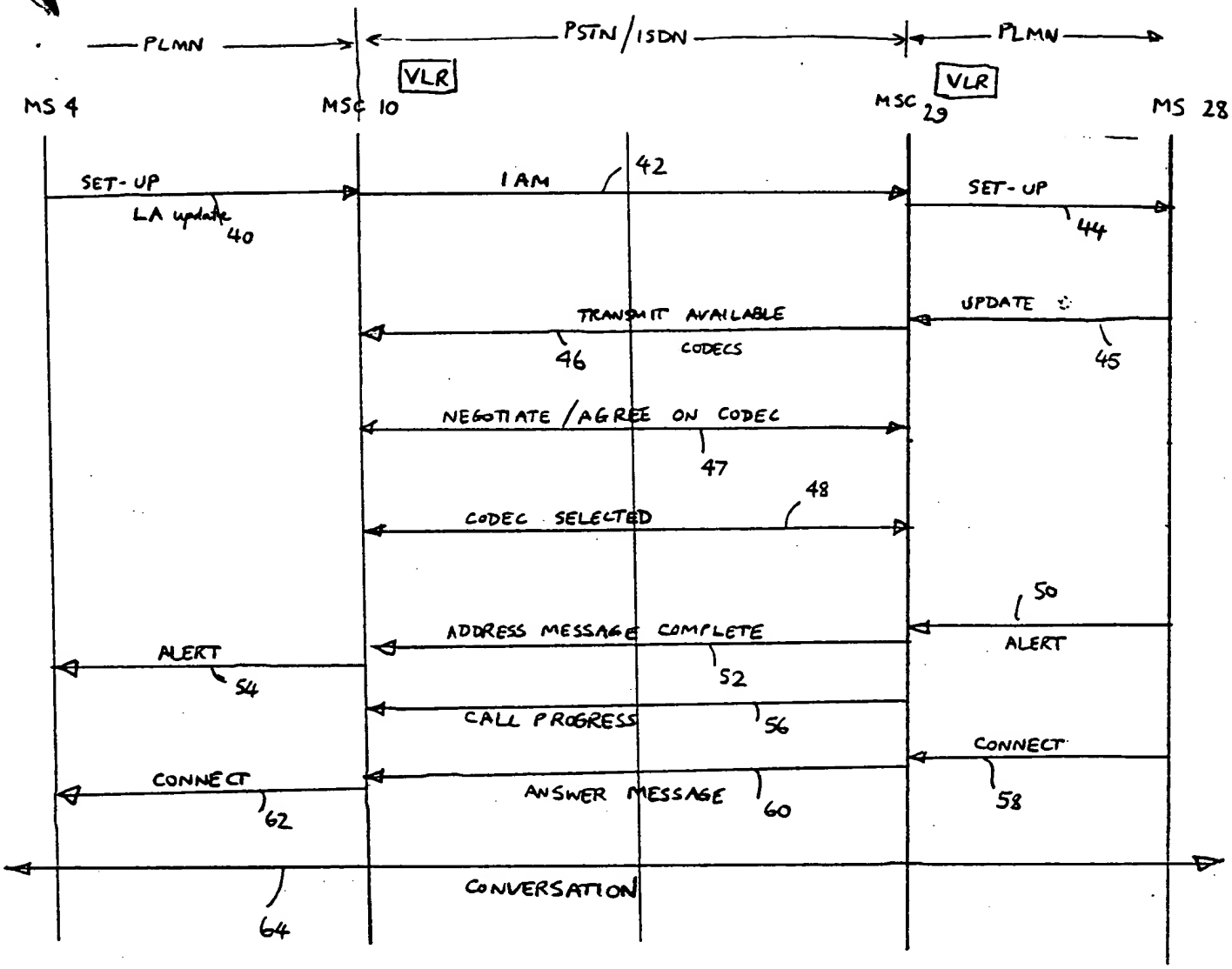

PLMN
PSTN/ISDN
PLMN
VLR
VLR
MS 4
MSC 10
MSC 29
MS 28
SET-UP
LA update
40
I AM
42
SET-UP
44
TRANSMIT AVAILABLE CODECS
46
UPDATE
45
NEGOTIATE/AGREE ON CODEC
47
48
CODEC SELECTED
50
ADDRESS MESSAGE COMPLETE
52
ALERT
ALERT
54
CALL PROGRESS
56
CONNECT
58
CONNECT
62
ANSWER MESSAGE
60
CONVERSATION
64

FIGURE 2